Saskatchewan
Environment
and Resource
Management

Guidelines

for Treatment and Disposal of Petroleum Contaminated Soils at Municipal Waste Disposal Grounds

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Foreword

These guidelines provide information on the land surface **treatment** option for petroleum contaminated soils and on the **disposal** of petroleum contaminated soils at municipal waste disposal grounds. The Commercial Branch of Saskatchewan Environment and Resource Management (SERM) should be contacted to obtain requirements for treatment at commercial soil treatment facilities or on private property.

A **municipality** wishing to accept petroleum contaminated soils at their waste disposal ground can use these guidelines to indicate the permitting requirements under *The Municipal Refuse Management Regulations*. These guidelines will also provide municipalities with a better understanding of the soil management steps needed to achieve full and satisfactory treatment of petroleum contaminated soils once accepted at their landfill.

Municipalities should be careful not to unduly restrict the regular operation of the waste disposal ground due to the land area and time required to treat petroleum contaminated soils. Heavier petroleum hydrocarbons such as engine oils require a longer treatment period than lighter hydrocarbons such as gasoline.

1.0 Introduction

Soil contamination commonly occurs when petroleum storage and handling systems leak and fuel spills contaminate surrounding soils, or when repeated overfills, surface spillage and housekeeping losses result in a contaminated area. When this occurs, the soil acts as an on-going source of contamination which may need to be remediated to prevent it from continuing to be a source of pollution.

These guidelines provide direction on the treatment of soils contaminated with **refined petroleum hydrocarbons**. For the purposes of this document, refined petroleum hydrocarbons includes any mixture of hydrocarbons that is or could be used as a combustible fuel and includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha, fuel oil and heating fuel, and lubricating oils such as new and used engine oil.

One of the most practical ways for treating petroleum contaminated soils is by some form of land surface treatment whereby petroleum contaminated soils are applied onto the soil surface and periodically turned over or tilled to aerate the contaminated soils to enhance the volatilization and biodegradation processes. To facilitate prompt remediation of the soils they must be spread thinly and disced or rototilled regularly.

Tilling the soils promotes volatilization (evaporation) of the lighter portions while the remaining compounds are immobilized within the soil mass and breakdown biologically. Naturally occurring soil micro-organisms such as bacteria and fungi combine with sunlight, oxygen and moisture to biodegrade (breakdown biologically) the petroleum products.

Soils which have been successfully remediated are acceptable for reuse, either as intermediate or final cover at municipal waste disposal sites.

2.0 Why Use Land Surface Treatment

Properly done, land surface treatment or soil venting will quickly and reliably destroy petroleum contaminants with negligible impact on ground or surface waters, the soils, human health or the environment.

In most instances, the breakdown of the petroleum residues is complete within one growing season, however this is very dependant upon the nature and concentration of the original petroleum materials as well as a number of other environmental factors. Venting of petroleum contaminated soil represents a cost-effective means of remediating soils with residual amounts of petroleum hydrocarbon contamination. This technique is not appropriate when there is free (liquid) petroleum product.

The following information is intended for municipalities wishing to accept petroleum contaminated soils for surface land treatment at municipal waste disposal grounds.

A municipal waste disposal ground is not required to obtain a permit or prior approval for receiving these materials.

Saskatchewan Environment and Resource Management requires that petroleum contaminated soil be treated prior to reuse or disposal. Landspreading of petroleum contaminated soils is effective in reducing the level of contaminants in the soil through the processes of volatilization (evaporation of the volatile compounds), biodegradation of the residual materials and, to a lesser extent, immobilization of some compounds.

3.0 Permission Requirements

Municipalities wishing to accept petroleum contaminated soils at their waste disposal ground may do so without permission from the department unless it is specifically prohibited by a Permit or Minister's Order.

Individuals must obtain permission from the owner to use a municipal waste disposal ground for treatment and disposal of petroleum contaminated soil.

4.0 Land Application Procedures

Recommended procedures for land surface treatment at municipal waste disposal facilities are outlined below.

- Contaminated soils should be applied when the land is tillable, generally no earlier than April 1 and no later than November 1, weather permitting. At times outside of these periods, the soils may be stockpiled if adequate and acceptable precautions are taken to prevent leaching of contamination from the petroleum contaminated soils into the underlying soils and runoff is contained on site.
- The greater the petroleum loading rate (the initial soil volumes and contaminant concentrations) the more time and effort the treatment of the soils will require. Contaminated soils should not be applied in thicknesses greater than can be completely turned over with one pass of the tilling equipment being used.
- Soil application rates for specific spreading thicknesses are as follows:
  - 1500 m^3/hectare (800 yd^3/acre) at 15 cm (6") spreading thickness
  - 1000 m^3 /hectare (530 yd^3 /acre) at 10 cm (4") spreading thickness
  - 500 m^3/hectare (265 yd^3/acre) at 5 cm (2") spreading thickness
- The area required for surface land treatment based on a spreading thickness of 15 cm (6") may also be approximated as follows:
  Acre(s) Required = Volume of Soil (yd^3 X 0.00125)
  Hectares Required = Volume of Soil (m^3 X 0.000667)
- The land application site should be marked with stakes and/or flags. The stakes should remain in place during treatment of the contaminated soil and until the remediated soil is removed.

- Soils should be tilled as soon as practical (within 48 hours) after application. Fertilizers or organic materials, if used, may be added either before or after soil spreading.
- To enhance hydrocarbon breakdown, the soil treatment layer should be thoroughly aerated (disced or tilled) approximately once every two weeks or as required to optimize hydrocarbon breakdown and satisfy the oxygen demand of the soil microorganisms. Frequent tilling may cause excessive volatilization, excessive drying and create dust problems, and should be avoided. Infrequent tilling may not provide adequate aeration and mixing particularly on heavy-textured soils and may slow hydrocarbon breakdown. Aeration is to continue until hydrocarbon concentrations decrease to acceptable levels.
- Odours generated from the treatment site will be greatest during initial spreading of the petroleum contaminated soils and initial tilling operations. Odour generation is highly temperature dependant. The odours generated from tilling may be mitigated by scheduling these activities during cooler weather or cooler times of the day such as morning or early evening. Tilling during windy conditions providing the treatment layer is moist enough to prevent or minimize dust may dissipate odours more efficiently and avoiding impacts on adjacent properties. Tilling should be avoided during inversions or calm periods.

5.0 Monitoring Requirements

Soil sampling to document the initial level of contaminants in the soils is recommended. Monitoring of the soils is also required to confirm completion of treatment for the contaminated soils.

If the soils are to be used as cover material at a municipal waste disposal facility, sampling and laboratory analyses of the treated soils is not required (but is recommended periodically as a check on the adequacy of the treatment methods used). At a minimum, if the soils have received one full treatment season (three consecutive months between May and September) and produce vapour readings of less than five per cent LEL (Lower explosive limit) using an explosion meter, the soils may be used for cover materials at the landfill.

The treatment site should be inspected periodically by the operator to ensure that the area is neither too wet (no water is ponding on the site) nor too dry.

Pre-screening of the contaminated soil layer using soil vapour concentration measurements will often provide an indication of the degree of contamination remaining in the soils. Once the vapour measurement results have been reduced to acceptable levels (less than five per cent LEL) or there is no significant hydrocarbon odour remaining in the soils, the soil is acceptable for cover material. Laboratory analysis can be used to confirm that treatment is complete.